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of the University of Pennsylvania, is announced. It will be published monthly, beginning in March, except during the summer months, each volume containing about 300 pages. "*The Psychological Clinic* will be devoted primarily to the study and treatment of mentally and morally deficient children, but this will not preclude the consideration of other types deviating from the normal child, nor yet of that hypothetical type, the so-called normal child. The methods of clinical psychology are necessarily invoked wherever the status of an individual consciousness is determined by observation and experiment, and pedagogical treatment applied to affect a change, *i. e.*, the development of such individual mind. Whether the subject be a child or an adult, the result of examination and treatment may be conducted and expressed in the terms of the clinical method. Thus, the phenomena of adolescence, of criminality and insanity, are best investigated by the clinical method. The neurologist and psychiatrist are just awakening to a realization of the psychological and pedagogical significance of the treatment usually prescribed in cases of hysteria, psychasthenia, aphasia and allied mental disorders."

SOCIETIES AND ACADEMIES

THE AMERICAN MATHEMATICAL SOCIETY

THE one hundred and thirty-second meeting of the society was held at Columbia University on Saturday, February 23. President H. S. White and Vice-President P. F. Smith occupied the chair at the two sessions. Thirty-three members were present. The following new members were admitted to the society: Professor T. M. Focke, Case School of Applied Science; Dr. D. C. Gillespie, Cornell University; Professor C. C. Grove, Hamilton College; Professor T. W. Palmer, University of Alabama; Professor N. A. Pattillo, Randolph-Macon Woman's College; Mr. F. D. Posey, University of Chicago; Miss Gertrude Smith, Vassar College; Dr. A. L. Underhill, Princeton University. Ten applications for membership were received.

Professor J. H. Tanner was elected treasurer

of the society, to succeed Dr. W. S. Dennett, who retires after seven years' service. Professor E. H. Moore, who has been editor-in-chief of the *Transactions* since the founding of that journal in 1899, retires from the editorial committee at the completion of the present volume. The vacancy in the committee was filled by the election of Professor Maxime Bôcher. Appropriate resolutions expressing the society's grateful appreciation of the services of these retiring officers were adopted.

A standing finance committee, consisting of the treasurer, Professor Brown, and Dr. Dennett, was established to have charge of the investment of the life-membership and surplus funds of the society. For the better regulation of the presentation of papers, it was ordered that papers should hereafter be read in the order and at the session announced on the printed program, except that papers whose reading is postponed may be read at the close of a session. Papers not on the printed program, but accepted for presentation, will be read at the close of a session after the printed list is exhausted. Abstracts of papers will hereafter be included in the printed program if furnished at least three weeks in advance of the meeting.

The Annual Register of the society, containing the list of officers and members, constitution and by-laws, reports of officers, catalogue of the library, etc., has recently been issued. Copies can be obtained from the secretary.

The following papers were read at this meeting:

R. D. CARMICHAEL: 'On dividing an angle into parts having the ratio of any given straight lines.'

R. D. CARMICHAEL: 'A table of multiple perfect numbers.'

G. A. MILLER: 'The groups generated by three operators each of which is the product of the other two.'

R. P. STEPHENS: 'On a quintic with three parallel tangents in any direction.'

E. B. WILSON: 'On the revolutions of a dark body about the sun.'

C. N. MOORE: 'On the introduction of convergence factors into summable series and summable integrals.'

G. A. BLISS: 'The construction of a field of extremals about a given point.'

R. G. D. RICHARDSON: 'Differentiation and integration of definite integrals.'

E. R. HEDRICK: 'On a final form of the theorem of uniform continuity.'

R. D. CARMICHAEL: 'On the classification of quartic curves possessing fourfold symmetry with respect to a point.'

The San Francisco Section met on the same day at Stanford University. The Chicago Section will meet at the University of Chicago on Saturday, March 30. At the next meeting of the society, on Saturday, April 27, Professor W. F. Osgood will deliver his presidential address, postponed from the annual meeting. The subject of the address is 'The Calculus in Colleges and Technical Schools.'

F. N. COLE,
Secretary

SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE

THE nineteenth meeting of the Society for Experimental Biology and Medicine was held in Schermerhorn Hall, Columbia University, in New York City, on Wednesday evening, December 19, 1906. The president, Simon Flexner, was in the chair.

Members present.—Auer, Beebe, Burton-Opitz, Calkins, Davenport, Emerson, Ewing, Flexner, Foster, Gies, Hatcher, Lusk, Mandel (A. R.), Meltzer, Meyer, Morgan, Noguchi, Norris, Sherman, Shaffer, Torrey, Wolf, Yatsu.

Members elected.—Alexis Carrel, Winfield S. Hall, William Ophüls, H. Gideon Wells.

*Abstracts of Original Communications*¹

An Experiment on the Localization Problem in the Egg of Cerebratulus: NAOHIDÉ YATSU.

The author found that the third cleavage does not always separate the entodermic stuff from the ectodermic, so that the embryo from the animal half sometimes invaginates and sometimes does not. But in shifting the third

¹The abstracts presented in this account of the proceedings have been greatly condensed from abstracts prepared by the authors themselves. The latter abstracts of the communications may be found in number two of volume four of the society's proceedings.

cleavage plane to the equator by compressing the egg immediately after the first division (in doing this, the second cleavage is suppressed until pressure is relieved, the third cleavage of the normal egg appearing next to the first) and in separating the animal half from the vegetative, the former always gave rise to an embryo without gut, anenteron. From this it may be concluded that in the egg of *Cerebratulus lacteus*, a little before or at the time of the third cleavage, the entodermic basis extends farther above than that of *Cerebratulus marginatus*.

Experiments upon the Total Metabolism of Iron and Calcium in Man: H. C. SHERMAN.

Each of the experiments was of three days duration and the same healthy man served as subject, throughout. On a diet of crackers and milk which furnished 0.0057 gram iron and 2.65 grams calcium oxide (Exp. I.), there was equilibrium with respect to iron, and a storage of calcium. When the diet consisted of crackers and egg-white with 0.0065 gram iron and 0.14 gram lime (Exp. II.), or of crackers alone with 0.0071 gram iron and 0.13 gram lime (Exp. III.) there were losses of both iron and calcium. These losses occurred through the intestine, but were evidently not due to intestinal putrefaction, since the ratio of sulphur in ethereal to that in simple sulphates in the urine was determined in Exp. III. and found to be as 1:25. The results appear to confirm the suggestion of Von Wendt that a deficiency of calcium in the diet may lead to a loss of iron as well as of calcium from the body. There was a slight tendency toward diarrhoea in each of the periods in which loss of iron and calcium occurred. The iron requirement evidently varied greatly, the average daily output for three experiments being 5.5, 8.7 and 12.6 milligrams, respectively. The lime requirement was found in further experiments (IV. and V.) to be about 0.75 gram of calcium oxide per day.

The Cause of the Treppe: FREDERIC S. LEE.

The treppe is usually ascribed to increased irritability caused by activity. The cause of the increased irritability has remained obscure. In studying the depressing action on muscle

of its fatigue substances the author often observed augmentation of activity instead of depression. A more careful investigation of this phenomenon shows that it may be produced by all of the three recognized fatigue substances, namely, carbon dioxide, mono-potassium phosphate and paralactic acid. When a muscle is irrigated with an indifferent fluid containing one of these substances in small quantity, and compared with its mate irrigated only by the indifferent fluid, a fatigue record being made from both, more intense contractions frequently occur in the poisoned muscle at the beginning of the experiment, and may last until exhaustion sets in. When a fatigue record is being made from a muscle with the circulation intact, intravenous injection of a fatigue substance causes augmentation of contraction. The author concludes that the *treppe* is due to the augmenting action of fatigue substances in small quantities—the same substances which in larger quantities cause depression or fatigue.

An excellent mode of demonstrating the augmenting action of CO_2 in the cat is to record the contractions of the *tibialis anticus* in the living animal, and while the record is being made, to clamp the trachea. A marked *treppe* follows.

If two corresponding muscles be compared, one with the circulation intact, and the other with its arteries ligated, the latter muscle performs more intense contractions and exhibits a more rapidly developing *treppe*, owing to the accumulation of fatigue substances.

The chemical theory of the *treppe* is able to explain several other known phenomena. The author has experimented on both frogs and cats. The augmenting action of the fatigue substances seems to be observed even when curare is employed.

The Influence of the Red Corpuscles upon the Viscosity of the Blood: RUSSELL BURTON-OPITZ.

After determining the coefficient for fresh ox serum at 37°C ., the serum was gradually concentrated by the addition of definite quantities of red blood corpuscles (washed). The viscosity of the 'blood' was tested after each addition of corpuscles.

The following data may serve as examples:

	Spec. Grav.	No. Red Corpuscles.	Viscosity Coefficient.
Serum	1.0248		2397.7
S + 30 c.c. corp. . .	1.0382	4,000,000	1442.9
S + 30 c.c. corp. . .	1.0467	4,700,000	1009.3
S + 30 c.c. corp. . .	1.0524	5,700,000	851.6

Thus, the increase in the number of red corpuscles caused a corresponding increase in the viscosity. It is also obvious that the red corpuscles constitute the principal factor in determining the viscosity of the blood.

A New Recording Stromuhr, with Demonstration: RUSSELL BURTON-OPITZ.

The cylinder of this stromuhr is placed horizontally and carries below its floor a valve, by means of which the inflowing blood can be diverted alternately into the right or left half of the instrument. The piston within the cylinder moves back and forth, therefore, in a horizontal direction and records its movements by means of a pulley arrangement and a writing lever upon the smoked paper of a kymograph.

On account of its great sensitiveness, and the possibility of low adjustment, this stromuhr is especially fitted for measuring the blood flow in the veins.

The instrument has been used by the author in testing possible vaso-motor reactions in the pulmonary circuit. It was connected with the vein draining the middle lobe of the left lung. The nerves in the vicinity of the ganglion stellatum were stimulated. So far the experiments have given negative results.

The Influence of Gelatin upon the Viscosity of the Blood: RUSSELL BURTON-OPITZ.

Solutions of gelatin (1000:50) were introduced intravenously after the normal viscosity of the blood had been determined. It was found that the injections resulted in a very prompt increase in the viscosity. The following data may serve as examples:

Specific Gravity.		Viscosity.	
Before Inj.	After Inj.	Before Inj.	After Inj.
1.0565	1.0543	836	772

The Hemolytic Effects of Organ and Tumor Extracts: RICHARD WEIL (by invitation).

The author has found that the cause of the

variability in the hemolytic effect of organ extracts, which has been noted by previous observers, is the varying admixture of blood. Kidneys prepared bloodlessly, by perfusion with salt solution, are hemolytic only in very low dilution, and after a long latent interval. Kidneys suffused with blood are, as a rule, very much more active; occasionally less so. The effects of blood have been analyzed by the separate addition of serum, emulsions of white cells (from artificial abscesses), and of red cells after washing, to the bloodless kidney extract. In each case it was found that hemolysis was inhibited. The question, therefore, arises, why are kidneys that have been suffused with blood as a rule more actively hemolytic than the bloodless organs? If their extracts are centrifuged, and all the solid particles, including the red cells, removed, it is found that the extracts are still deeply stained by hemoglobin. This is due to the destruction and solution of red cells, which is inseparable from the process of preparing the extract. The next step, therefore, was to determine the effect of adding red cell constituents to the bloodless organ extracts. This was prepared by adding red cells to distilled water, and then bringing the solution to the strength of normal salt solution. Such a solution adds very markedly to the hemolytic power of the organ extract. Its manner of action seems to resemble that of complement, inasmuch as it is capable of breaking up the red cells only after a preliminary treatment with the organ extract.

Tumors were investigated in the same manner as the kidneys. It was found that the non-necrotic tumors are somewhat more hemolytic than are the kidneys, owing possibly to their blood content. They act, however, in other ways precisely like the latter, their action being diminished by the addition of serum and of white cells, and being increased by the red cell extract.

Necrotic areas of tumors are extremely hemolytic, even up to dilutions of two in four hundred. This hemolytic activity is not affected by the addition of the blood components.

The Enzymotic Properties of Diplococcus intracellularis: SIMON FLEXNER.

The brief vitality of many of the cultures of *Diplococcus intracellularis* is a point of differential importance. Many strains, grown on a favorable medium, unless transplanted to a fresh medium, do not survive beyond two or three days. Cultures three days old show marked degenerations and the latter increase rapidly with age until, at the end of five or six days, or even earlier, no normal cocci persist. As degeneration progresses, loss of staining power and disintegration ensue, until finally, staining is lost and a formless detritus remains.

The changes in the diplococcus are associated with the action of an enzyme which brings about the disintegration. This enzyme does not exhibit the usual properties of a proteolytic ferment: it does not liquefy gelatin or coagulated serum. The degree of rapidity of its action varies with its concentration: at least a heavy suspension of the cocci in salt solution, kept at 37° C., undergoes dissolution more rapidly and completely than a weaker suspension. The vitality of the cultures is associated with the degree of autolytic alterations in the suspensions: cocci in the weak suspensions survive longer than in the stronger ones. At lower temperatures—2° C.—disintegration of the cocci either does not take place at all or progresses much more slowly. Under the latter conditions more cocci survive in the strong than in the weak concentrations, although even here the vitality is a brief one.

The enzyme of the diplococcus acts energetically upon other bacteria, bringing about their dissolution. It acts upon *B. typhosus*, *B. coli communis*, *B. pyocyaneus*, *B. anthracis*, *M. catarrhalis*, and to a less degree and more slowly upon *Staphylococcus aureus*.

On the Supposed Existence of Efferent Fibers from the Diabetic Center to the Liver: J. J. R. MACLEOD and C. E. BRIGGS.

The authors have found that no hyperglycemia is produced by stimulation of the splanchnic nerves, or of the spinal cord below the cervical region. In the cervical region, on the other hand, stimulation produces hyperglycemia except when oxygen is very freely delivered into the trachea. By such adminis-

tration it has been shown by Hirsch that the blood remains arterial even after the respiratory movements have been inhibited by curare. When the cervical spinal cord is stimulated, and especially when it is cut, the respiratory movements are very considerably interfered with so that a partial asphyxia is produced which may be the cause of the hyperglycemia.

The fact that stimulation of the cervical cord causes glycosuria can not, therefore, be taken as a proof of the existence of efferent fibers which control the glycogenic function of the liver. Dyspnea may be the cause of the hyperglycemia in these cases.

Regarding the other evidence, which is supposed to point to the existence of such fibers, the authors stated that in all the experiments on which it is based (viz., cutting the splanchnics, or sympathetic chain, or certain roots, or the spinal cord) there must have been induced by the operation, a great fall of blood pressure which, in the cases of dogs with vagal glycosuria, Macleod and Dolley have shown usually to cause a marked depression in the reducing power of the urine.

Conclusion.—When every precaution is taken to prevent asphyxia the authors have been unable, so far, to demonstrate the existence of any efferent fibers whose stimulation causes hyperglycemia.

WILLIAM J. GIES,
Secretary

THE BIOLOGICAL SOCIETY OF WASHINGTON

THE 424th meeting was held January 26, 1907, with President Stejneger in the chair.

Mr. H. W. Clark described some observations on *Riccia lutescens* and *R. natans*. Among the many examples of adaptation in plants to alternating conditions of drouth and moisture, conditions which prevail most strikingly in temporary ponds, perhaps the most remarkable is that furnished by *Riccia lutescens*.

One of the first things to catch the eye of a visitor to the shallow woodland ponds of the northern states is a fleet of little fronds floating on the surface roughly resembling small green butterflies in general appearance. The plants would probably be found to be actively

dividing into equal parts by a sort of decay along a median groove, a form of reproduction strikingly resembling that of single cells and lower organisms. Each frond has its under surface beset with long rhizoid-like scales which act as balancing organisms, so that if a frond is overturned it immediately rights itself. According to descriptions in books the plant just noticed is *Riccia (Ricciocarpus) natans*.

A visit to the same pond during the dry season would reveal numerous orbicular or elongate thalli creeping on the moist ground. These would be determined at once according to the literature as *R. lutescens*.

A third visit to the same pond some time after the rains had filled it would result in the discovery of the lately creeping fronds lifted to the surface, and in all stages of change to the floating phase. Experiments with the plants at the proper season—slowly drying basins containing floating phases, or slowly raising the water surface on the creeping phases—will result in the change of one phase to the other. These experiments might not be perfectly satisfactory, however, if attempted much out of season, for the plant has long been accustomed to making these changes at certain seasons, and would probably yield to treatment more readily at such times. About ten years ago, while attempting the experiments indicated with these plants during the spring, they fruited abundantly.

In view of these facts, one might naturally assume that *R. lutescens* and *R. natans* are different phases of the same species; this conclusion has indeed been darkly hinted at, and finally distinctly stated by one author.¹

A visit to the marshy edge of one of our lakes or permanent ponds, however, will reveal the real *R. natans* a smaller plant than *R. lutescens*, with deep purple tinge about the edge and in the balancing scales. The balancing scales themselves are much more fully developed in *R. natans* and form a more conspicuous part of the plant as a whole.

¹Charles E. Lewis, *Bot. Gazette*, XLI., No. 2, pp. 109–138, where a graphic account of all these changes are described and illustrated in full, and the genus is pretty thoroughly revised.

As it is, the floating phase of *Riccia lutescens* has always been identified with *R. natans* and is probably always labeled so in collections. Which species is really *R. natans* can probably only be told by examination of the type specimens. Indeed, it is likely that there are many more specimens of the floating phase of *R. lutescens* labeled *R. natans* than there are of the real *R. natans*, as the former is a much more conspicuous plant, and the latter is for various reasons much more readily overlooked. There are two distinct species in question, and each has two distinct phases.

The following brief diagnosis is, therefore, appended:

Riccia lutescens Schw., floating phase.

Thallus bright green, usually semi-orbicular to orbicular, its approximation to a complete circle being dependent on presence or absence of agitations of water-surface, waves tending to separate thalli into segments. Upper surface deeply furrowed, the main furrow functioning as the dividing line of thalli in vegetative reproduction.

Differing from *R. natans*, floating phase, in larger size, brighter green color, relatively less fully developed balancing scales, and from the fact that it is confined exclusively to temporary waters, while *R. natans* is found only in permanent waters.

Dr. W. H. Dall read 'Notes on Some Cretaceous Volutidæ,' describing the development from the Turonian upward of a group of Volutidæ which seems to have been derived from some type like *Piestochilus* Meek, to have attained a large size and striking characteristics and to have culminated in the upper Senonian or Ripley horizon in various parts of the world. The group is found represented in India, the Tyrol, North Germany and various parts of North America, represented in each region by analogous types, while each regional group has a certain local facies of its own. In North America two lines of descent were noted, represented by the genera *Volutoderma* and *Volutomorpha*, neither of which is represented in any horizon subsequent to the Ripley, though a distinct genus appears in the

Tertiary of northwest America which has been more or less confused with them.

Dr. O. F. Cook read a paper on 'Parthenogenesis and Alternation of Generations in the Parasitic Hymenoptera.' The discoveries regarding the embryology of the parasitic hymenoptera presented by Dr. Howard at a former meeting of the society² are not merely a contribution to the study of sex-determination. They have brought to light an entirely new form of alternation of generations among the insects. Polyembryony is a botanical term which fits these zoological facts but poorly, and conceals a very close analogy with the typical and original instance of alternation of generations, that of the tunicates, described by Chamisso in 1819.

Polyembryony is the production or inclusion of two or more embryos in one set of seed-coats, instead of the usually single embryo. But it does not follow that the multiple embryos of plants are produced by vegetative propagation of the original egg or embryo, as are the chains of larvæ in tunicates and in these parasitic hymenoptera. Nor does the body of the host in which these chains of insect larvæ are formed correspond to the embryo-sac and seed-coats which enclose the multiple embryos of plants. The multiple plant embryos arise, as far as known, from the presence of two or more ova in the embryo-sacs, or from the intrusion of buds from the nucellar tissue. The polyembryony of plants has no necessary relation to sex-determination, for bisexual or hermaphrodite plants are reproduced from multiple embryos. To multiply sexually differentiated plants by vegetative propagation does not affect their sexual status, and the indications are that this is true also of animals.

Alternation of generations, that is, the alternation between vegetative propagation and sexual reproduction, has long been known among the hymenoptera. The form of alternation recently discovered in the parasitic families differs from the other in that the vegetative propagation takes place at a different period in the life history, in the early

² SCIENCE, December 21, 1906, 810, 'Polyembryony and the Fixing of Sex.'

larval phase, rather than in the late larval or the adult stage, as in the gall-forming hymenoptera and the plant-lice. It may be that this new method of vegetative propagation of the larvæ of parasitic insects should receive a distinct name. To call it polyembryony is to mislead all who know what is meant by polyembryony in the original application of this term among plants.

By recognizing the analogy with the previously known instances of alternation of generations among insects the new discoveries become much more interesting than when interpreted as polyembryony. These chains of larvæ correspond to the series of so-called parthenogenetic females of the gall-insects and the plant-lice, which are propagated by vegetative budding. If the fact that all the individuals of the same larva-chain are of the same sex represents a general principle of sex-determination, we must expect to find that this is also true of all the other series produced by vegetative budding. Not only will all the sexual offspring of an individual bud-propagated plant-louse be of one sex, but all the offspring which arise from each original egg of a sexual female. This would mean that what we now call parthenogenetic females are not really females, but represent the two sexes, both temporarily propagated by budding instead of by sexual reproduction. In support of this interpretation we have the fact that even the wingless, larviform, bud-producing plant-lice which are classified as the same species may show two distinct forms, as in the cotton aphid. It now becomes justifiable to suspect that these two forms may represent males and females, and that there may be explained in this way a larval dimorphism which previously appeared altogether mysterious. Adult female plant-lice are wingless, as in all the related families, but the members of these bud-propagating generations are often winged. This has made it necessary to believe that larval females might be winged while the adult females were always wingless, a unique and highly anomalous assumption which the present considerations may enable us to avoid. It is possible that the bud-producing winged insects may prove, after all, to represent the

male sex, in spite of their apparent parturition.

One more confusion of terms remains to be noted. The so-called parthenogenesis of these bud-producing plant-lice is entirely distinct from the parthenogenesis of male hymenoptera from unfertilized eggs. If bud-propagation of insects is to be reckoned as parthenogenesis, then the hymenoptera have two forms of parthenogenesis, one a method of sex-determination, the other a method of vegetative multiplication. The hemiptera are now known to have a different method of sex-determination, by means of specialized chromosomes and two or more kinds of spermatozoa, so that the plant-lice should not be expected to agree with the parasitic wasps in sex-determination, even though the methods and results of vegetative propagation should prove to be entirely analogous in the two groups.

Mr. W. F. Wight read the last paper, entitled 'The History of the Cowpea and Its Introduction into America.' This will be published by the U. S. Department of Agriculture.

M. C. MARSH,
Recording Secretary

DISCUSSION AND CORRESPONDENCE

REVERSION INDUCED BY CROSS BREEDING

DR. CASTLE¹ in an explanation for reversion, thinks that the wild agouti color has been introduced through the red parent (when crossed with black); and bearing on this is Dr. Davenport's explanation of reversion to *Gallus bankiva* color, in a cross with white and black poultry, their difference being that Dr. Castle ascribes the reversion of wild color as being added to, and Dr. Davenport as being taken from.

The latter, in his address at the New York meeting, December 28, explains the phenomena of wild color as being due to the absorption of black by the white, leaving the wild color clean. Perhaps both are right in their respective examples.

We wish to tell of some cases, wherein neither of these explanations can be applied as a cause for the reversions.

¹ SCIENCE, January 25, p. 151.